

**THE TERMINAL STRIKE CONTROLLER:  
THE WEAK LINK IN CLOSE AIR SUPPORT**

**A Monograph**

**by**

**Major Raymond O. Knox**

**United States Air Force**



**DTIC**  
**ELECTE**  
**MAY 30 1989**  
**S H D**  
*cb*

**School of Advanced Military Studies  
United States Army Command and General Staff College  
Fort Leavenworth, Kansas**

**First Term AY 88-89**

**Approved for Public Release; Distribution is Unlimited**

**AD-A208 256**

| REPORT DOCUMENTATION PAGE  |       |  |   | Form Approved<br>OMB No. 0704-0188                |                                |
|--|-------|--|---|---|--------------------------------|
| 1a. REPORT SECURITY CLASSIFICATION<br><b>UNCLASSIFIED</b>  |       |  | 1b. RESTRICTIVE MARKINGS  |   |                                |
| 2a. SECURITY CLASSIFICATION AUTHORITY  |       |  | 3. DISTRIBUTION / AVAILABILITY OF REPORT  |   |                                |
| 2b. DECLASSIFICATION / DOWNGRADING SCHEDULE  |       |  | Approved for public release;<br>distribution unlimited                            |   |                                |
| 4. PERFORMING ORGANIZATION REPORT NUMBER(S)  |       |  | 5. MONITORING ORGANIZATION REPORT NUMBER(S)                                       |   |                                |
| 6a. NAME OF PERFORMING ORGANIZATION<br>School of Advanced Military<br>Studies, USAC&GSC  |       | 6b. OFFICE SYMBOL<br>(if applicable)<br>ATZL-SWV | 7a. NAME OF MONITORING ORGANIZATION   |   |                                |
| 6c. ADDRESS (City, State, and ZIP Code)  |       |  | 7b. ADDRESS (City, State, and ZIP Code)   |   |                                |
| 8a. NAME OF FUNDING / SPONSORING<br>ORGANIZATION   |       | 8b. OFFICE SYMBOL<br>(if applicable)             | 9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER                                   |   |                                |
| 8c. ADDRESS (City, State, and ZIP Code)  |       |  | 10. SOURCE OF FUNDING NUMBERS   |   |                                |
|  |       | PROGRAM<br>ELEMENT NO.                           | PROJECT<br>NO.  | TASK<br>NO.                                       | WORK UNIT<br>ACCESSION NO.     |
| 11. TITLE (Include Security Classification)<br>The Terminal Strike Controller: The Weak Link In Close Air Support (U)  |       |  |   |   |                                |
| 12. PERSONAL AUTHOR(S)<br>Major Raymond O. Knox, USAF  |       |  |   |   |                                |
| 13a. TYPE OF REPORT<br>Monograph   |       | 13b. TIME COVERED<br>FROM _____ TO _____         |   | 14. DATE OF REPORT (Year, Month, Day)<br>88/11/14 |                                |
| 15. PAGE COUNT<br>49   |       |  |   |   |                                |
| 16. SUPPLEMENTARY NOTATION   |       |  |   |   |                                |
| 17. COSATI CODES   |       |  | 18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number) |   |                                |
| FIELD  | GROUP | SUB-GROUP  | close air support      forward air control  |   |                                |
|  |       |  | air liaison              tactical air support                                     |   |                                |
|  |       |  | terminal strike control   |   |                                |
| 19. ABSTRACT (Continue on reverse if necessary and identify by block number)   |       |  |   |   |                                |
| <p>This monograph is written in three parts. The first part discusses the history and development of the terminal strike controller, specifically the Forward Air Controller (FAC) and the Air Liaison Officer (ALO). There have been many substantive changes since the beginning of our Close Air Support (CAS) experience in WW II. All too often, however, the wheel has had to be reinvented.</p> <p>The second section discusses the current situation in regards to terminal strike control of CAS. The current policy of "by name ALOs" down to battalion level and the new program of Enlisted Forward Air Controllers (EFAC) are discussed. This section concludes with the assertion that today's system of terminal strike control is good, but not as good as it could be or needs to be.</p> <p>The third section is devoted to listing some of the shortfalls of the current system. The shortfalls are addressed in the physical, cybernetic, and moral domains. In the physical domain are the effects of terrain, equipment and weapons effects of the enemy. The cybernetic domain is concerned with the command and control aspects of terminal strike control. The moral domain looks at the recruiting and training of FACs, ALOs, and EFACs. Some suggestions for alleviating the problems are offered.</p> |       |  |   |   |                                |
| 20. DISTRIBUTION / AVAILABILITY OF ABSTRACT<br><input checked="" type="checkbox"/> UNCLASSIFIED/UNLIMITED <input type="checkbox"/> SAME AS RPT. <input type="checkbox"/> DTIC USERS  |       |  | 21. ABSTRACT SECURITY CLASSIFICATION<br>UNCLASSIFIED                              |   |                                |
| 22a. NAME OF RESPONSIBLE INDIVIDUAL<br>Maj Raymond O. Knox   |       |  | 22b. TELEPHONE (Include Area Code)<br>AV 552-3437                                 |   | 22c. OFFICE SYMBOL<br>ATZL/SWV |

School of Advanced Military Studies  
Monograph Approval

Name of Student: Major Raymond O. Knox  
Title of Monograph: Requirements for Rated Air Force Officers  
to Serve as FACs and ALOs.

Approved by:

Robert M. Epstein Monograph Director  
Robert M. Epstein, Ph.D.

L. D. Holder Director, School of  
Colonel L. D. Holder, MA Advanced Military  
Studies

Philip J. Brookes Director, Graduate  
Philip J. Brookes, Ph.D. Degree Programs

Accepted this 14th day of January 1989.



|                    |  |
|--------------------|--|
| Accession For      |  |
| NTIS GRA&I         | <input checked="checked" type="checkbox"/> |
| DTIC TAB           | <input type="checkbox"/>                   |
| Unannounced        | <input type="checkbox"/>                   |
| Justification      |  |
| By                 |  |
| Distribution/      |  |
| Availability Codes |  |
| Avail and/or       |  |
| Dist               | Special                                    |
| A-1                |  |

**The Terminal Strike Controller:  
The Weak Link In Close Air Support**

by

**Major Raymond O. Knox  
United States Air Force**

**School of Advanced Military Studies  
U.S. Army Command and General Staff College  
Ft. Leavenworth, Kansas**

**14 November 1968**

**APPROVED FOR PUBLIC RELEASE:  
DISTRIBUTION UNLIMITED.**

## ABSTRACT

**THE TERMINAL STRIKE CONTROLLER: THE WEAK LINK IN CLOSE AIR SUPPORT** by MAJ Raymond O. Knox, USAF, 49 pages.

This monograph is written in three parts. The first part discusses the history and development of the terminal strike controller, specifically the Forward Air Controller (FAC) and the Air Liaison Officer (ALO). There have been many substantive changes since the beginning of our Close Air Support (CAS) experience in WW II. All too often, however, the wheel has had to be reinvented.

The second section discusses the current situation in regards to terminal strike control of CAS. The current policy of "by name ALOs" down to battalion level and the new program of Enlisted Forward Air Controllers (EFAC) are discussed. This section concludes with the assertion that today's system of terminal strike control is good, but not as good as it could be or needs to be.

The third section is devoted to listing some of the shortfalls of the current system. The shortfalls are addressed in the physical, cybernetic, and moral domains. In the physical domain are the effects of terrain, equipment and weapons effects of the enemy. The cybernetic domain is concerned with the command and control aspects of terminal strike control. The moral domain looks at the recruiting and training of FACs, ALOs, and EFACs. Some suggestions for alleviating the problems are offered.

## TABLE OF CONTENTS

|   | Page |
|---|------|
| GLOSSARY.....   | i    |
| I. Introduction.....  | 1    |
| II. Section 1<br>History Of The Terminal Strike Controller..... | 3    |
| III. Section 2<br>Where We Are Today.....                       | 17   |
| IV. Section 3<br>Shortfalls In The Current System.....          | 24   |
| V. Conclusion .....   | 37   |
| ENDNOTES.....   | 40   |
| BIBLIOGRAPHY .....  | 45   |

## Glossary

AFAC--Airborne Forward Air Controller, an Air Force pilot flying an observation or FAC aircraft certified to conduct terminal air control from his airborne platform.

Air Request Net--a radio net used exclusively for requesting close air support. Operated by the Air Force and monitored by all command levels between requestor and ASOC, silence on the net is deemed concurrence by levels above the requestor.

AGOS--Air-Ground Operations School located at Hurlburt Field, FL. Home of the Joint Firepower Control Course, JFCC.

ALO--Air Liaison Officer, the rated Air Force officer that sits on the Army ground commanders special staff and advises the commander on the use of tactical air power. Coordinates the request through the Air Force Air Request Net.

ASOC--Air Support Operations Center, formerly the DASC or Direct Air Support Center, the focal point for air requests. The ASOC initiates the planning and coordination necessary to satisfy the CAS request and, in the absence of disapproval, orders the mission flown.

ASP--Air Support Party, the precursor of the TACP. Created by FM 31-35, April 1942.

ETAC--enlisted terminal attack controller. A recent development by the Air Force which, until recently, had considered enlisted members controlling air an emergency procedure. A selected 275X0 who is specifically trained and certified by the unit commander to perform the terminal attack control function on a routine basis.

FAC--Forward Air Controller, an Air Force pilot either on the ground or in a FAC aircraft that acts as an advisor to the commander in the field (supplemental to the ALO) on matters concerning CAS, also directs the terminal control of the aircraft

to insure the safety of our own ground troops and the destruction of the designated target.

GFAC--Ground Forward Air Controller, a rating applied to rated officers performing the ALO or AFAC functions who are also certified to perform the terminal attack control function from a ground location utilizing non-airborne systems and equipment.

IFCC--Joint Firepower Control Course, mandatory school for all ALOs, FACs, and ETACs.

MBA--main battle area. Where the bulk of the two opposing forces meet in combat.

OV-10 (Bronco)--a current FAC aircraft. A dual-seat, propellor-driven aircraft capable of carrying an air observer with the Pilot.

OA-37 (Dragonfly)-- a current FAC aircraft, a modified Cessna T-37 trainer. A dual-seat, jet-powered aircraft capable of carrying an air observer with the Pilot.

OA-10 (Thunderbolt II)--the proposed future FAC aircraft, an A-10 Attack aircraft capable of carrying the entire range of air delivered ordnance. A single seat aircraft.

ROMAD--Radio Operator, Maintainer, And Driver. The enlisted member of the TACP. Recently the acronym lost it's significance when the enlisted personnel became officially Tactical Air Control Specialists. Sentimental attachment, however, has caused the name Romad to remain attached to these members of the TACP.

TACS--Tactical Air Control System, the TACS provides the means by which the air commander can effectively employ his forces in combat operations

TASS--Tactical Air Support Squadron, the home of AFACs and "by name" ALOs assigned but not attached to Army Maneuver units.



TASC--My invention, Terminal Air Strike Controller. Anyone, Army or Air Force, trained and certified to control the application of CAS.

TDY--Temporary duty status, usually away from home station.

WSO--Weapons System Officer, a navigator rated officer trained as a crewman in two-seat tactical fighters. Other than fighter pilots the only other rated officer allowed to perform ALO duties.

275X0--An Air Force Specialty Code (AFSC) used to designate those enlisted members of the TACP. Known colloquially as ROMADs.

## INTRODUCTION

In today's AirLand Battle Doctrine the close integration of land and air forces is considered an absolute necessity for waging a successful military effort. This has been recognized since World War II and has provided the basis for numerous joint planning initiatives, exercises, agreements, and doctrine.

To the Army one of the most visible, and certainly one of the most important areas that requires direct interface between air and land forces is the Tactical Air Control System (TACS). The US Air Force TACS coordinates the tactical air support requirements of the ground commander with the resources of the Air commander and provides the means to control tactical air operations. The TACS also coordinates joint operations with components of other military forces.

The backbone of the TACS is the terminal strike controller--the person who directs the application of close air support (CAS) against targets at the request of the Army ground commander. Since World War II the Army Air Corps, and later the US Air Force, has furnished Air Liaison Officers (ALO), Forward Air Controllers (FAC), and most recently the Enlisted Terminal Attack Controller (ETAC) to the Army ground forces to coordinate the request and delivery of close air support. The system used today for selecting, training, and utilizing these officers has naturally evolved since the WW II days, but is still recognizable as the same system.

FM 100-5, the Army's keystone doctrine manual, and to a lesser extent AFM 1-1, the Air Force's basic doctrine manual, emphasize the tenets of AirLand battle and the principles of war. The current system for utilization of FAC/ALOs violates several of these doctrinal principles and tenets. For instance AFM 1-1 states the capabilities of aerospace forces to be responsive, mobile, survivable.<sup>1</sup> On

today's extended battlefield with only one active Terminal Strike Controller per battalion the Air Force is hardly responsive to the majority of the main battle area (MBA) frontage. The mobility of the terminal strike controller is also in doubt; both the enemy and the terrain throughout the depth of the battle will conspire to reduce mobility. Lastly, with no redundancy of terminal strike controllers to service an entire battalion zone, the system is not survivable. The highly responsive, mobile, Airborne FAC (AFAC) is, by nature, a slow moving aerial target and hardly survivable in today's sophisticated anti-air arena.

Section one of this paper will examine the history of the terminal strike controller, specifically the FAC and ALO. Section two will examine the system as it now exists comparing it with the US Marine Corps system and Soviet system of close air support. Section three will address the moral, physical, and cybernetic pluses and minuses of the system as it now exists and some possible solutions to the deficiencies.

## SECTION 1

### HISTORY OF THE TERMINAL STRIKE CONTROLLER

Close Air Support (CAS) as we know it today has its roots in the inter-war years between WW I and WW II. The distinction of being the first to use U.S. tactical air in support of ground troops on a regular basis goes to the US Marine Corps during their operations in Nicaragua in 1927. On the first occasion of air-ground cooperation the Marine pilot landed his aircraft on a road near the ground forces to get information on the whereabouts of the enemy, then took off again and delivered his ordnance as directed by the ground commander.<sup>2</sup> Other means for transmitting information to the pilot were experimented with such as signal panels and smoke, but until radios could be made small enough and rugged enough to accompany ground troops and be installed in aircraft, the Marines had taken CAS coordination to its limit.

The first use of radio controlled CAS and coincidentally the first Air Liaison Officer (ALO) was seen in 1936 during the Spanish Civil War. Colonel Wolfram von Richtofen, cousin of the famous "Red Baron" of WW I fame, was Chief of Staff for the German Condor Legion, fighting on the side of the Nationalists. A lack of Nationalist artillery tubes prompted von Richtofen to try using some otherwise obsolete He-51 fighter planes as flying artillery.<sup>3</sup> Coordination problems occurred early in the experiment, often causing German aviators to complain that friendly infantry did not press the attack after the air preparation of the target. Placement of an air liaison officer, equipped with a radio, near the front eased these problems and made the application of air power much more flexible. In one case, following an aerial bombardment, the advancing infantry found the enemy had surrendered without a fight.<sup>4</sup>

The German and Russian military both carried away valuable lessons about tactical air support from the Spanish Civil War. The Russians had bombers, reconnaissance planes, close support planes, ground attack planes and fighters as good or better than those of the Germans when Hitler turned on them in 1941 (unfortunately, following the Stalinist purge there was little corporate memory on how to use them). Among the lessons learned during the Spanish Civil War that were to become the cornerstone for Hitler's *Blitzkrieg* were: the use of bombing to replace the traditional pre-offensive artillery barrage, the employment of close support aircraft to shatter enemy morale and to disrupt defensive deployments, the use of dive bombers in breaching fortifications or against individual strong points, the use of air to ground radio, and the air liaison stationed with the front line troops.<sup>5</sup> The United States military would learn these same lessons in the course of WW II.

In the United States, the interwar years saw Army Air Corps doctrine developed along conventional lines with the Air Forces as organic or in direct support of ground units. Army Training Regulation 440-15, dated 1926, and its 1935 revision clearly stated that tactical operations took precedence over strategic operations.<sup>6</sup> The fledgling Air Force, however, advocated the doctrine set forth by Douhet, Mitchell and Trenchard. The proper role for the Air Force, according to these doctrinal pioneers, was strategic bombardment.<sup>7</sup> This was a mission that neither the Navy nor the Army ground forces could conduct. As a result of the impact of the strategic emphasis the US entered the war with the B-17, the best long range bomber of its time. Unfortunately, the mentality created by these prophets of strategic bombardment had a definite impact on air-ground cooperation during the pre- and early WW II years. During the Louisiana VIII Corps maneuvers (1942)

tactical aviation was in such a state that only 263 aircraft were operational out of a combined table of organization strength of 753.<sup>8</sup>

WW II saw the Army Air Corps expand at a phenomenal rate. On June 20th, 1941 the Army Air Forces (AAF) was created and in 1942 the War Department made the Army Air Forces coequal in status with the Army Ground Forces.<sup>9</sup> The role of the Air Support Party (ASP), the forerunner of today's Tactical Air Control Party, was defined in the 1942 version of FM 31-35, Aviation In Support Of Ground Forces.<sup>10</sup> Despite the expansion of the AAF, tactical support was largely neglected in favor of the strategic bombing and air superiority missions.

While the German *Blitzkrieg* showed what proper air-ground cooperation could accomplish in a modern war the US entered full tilt into WW II and quickly discovered that ground identification panels were inadequate to direct modern aircraft in support of ground forces. In the Pacific Theater air superiority was usually easy to achieve and maintain and the strategic bombardment of the enemy was not possible, until 1944, due to the long ranges involved, allowing the tactical application of airpower to flourish. Also ground targets were generally those that the Air Force was interested in from the standpoint of obtaining advance bases. As a result the Pacific theater saw a rapid development of ground support techniques including a front line "air forward observer" for each Marine Corps regiment. The idea was borrowed from the Royal Australian Air Force.<sup>11</sup> This air forward observer was not a pilot, but rather an infantry or artillery officer who gave pre-mission briefings to pilots. In the Pacific, by December 1943 a true tactical air control party was being utilized to control bomber strikes by radio messages direct to the pilots.<sup>12</sup>

In the China, Burma, India (CBI) Theater tactical air support evolved in a similar manner. At first there was a lack of radios that kept the ASP from conducting any real terminal strike control. The theater commander made do with what he had. After air superiority had been established it was relatively easy to construct aerial photo mosaics of the areas directly in front of the friendly troops. Copies of photos were made with a grid overlaid and distributed to the supported ground unit and the supporting air organization. When a ground commander ran into a problem he could not handle he was able to travel or telephone back to the ground headquarters and have the request passed on directly to the Air Headquarters representative located near the front. The request would be radioed back to the air unit along with any special instructions, i.e., "enemy dug in along north side of clearing, friendly troops 100 meters south". This technique worked very well on such a static front. Later in the war when radios became more available US Air Support Parties would accompany the mobile Chinese units and support the British. These ASPs transported their radios and other equipment on mules and traveled with the leading elements of the ground forces.<sup>13</sup> With direct radio communication with the aircraft and grided photo mosaics in lieu of maps, air-ground cooperation reached its high point in the CBI theater.

On the other side of the globe the US was not advancing its air-ground cooperation at the same rate. It was the British who led the way in close support techniques. In North Africa the British were the first to put a radio in a tank to control CAS, helping the ground forces to break the Mareth line at the Battle of El Hamma.<sup>14</sup> Meanwhile during this time Assistant Secretary of War John McCloy made the following observation concerning close support after a trip to Africa:

"It is my firm belief that the Air Forces are not interested in this type of work, think it is unsound,

and are very much concerned lest it result in control of air units by ground forces. Their interests, enthusiasm, and energy are directed to different fields."<sup>15</sup>

It was not until the US began its drive to capture Sicily that ground and air commanders began to work out the practical techniques which would lead to a workable close support system.

The US methods of controlling close support closely followed the British example. In the Mediterranean Theater of Operations the Commander of the XIIth Air Support Command was the driving force behind the plan to optimize tactical air-ground cooperation in the Fifth Army.<sup>16</sup> For the first time in this theater experienced US fighter pilots were put into vehicles and taken to the front lines to control the delivery of tactical airpower for the ground commander. Rover Joe, as these forward air controllers were nicknamed in Italy, were patterned after their British counterparts Rover David and Rover Paddy.

Rover Joe was not just a single man, but a team. The team consisted of 2 Forward Air Controllers (FACs), the Ground Liaison Officer (GLO), and fifteen enlisted men who supported the operation. Included were drivers, maintenance men, communications specialists, and cooks. Not every ground maneuver unit had a Rover Joe attached to it, rather, the teams were reserved for units in areas where air support of the ground forces was definitely planned. Part of the team would deploy with the leading army units and maintain radio contact with the GLO. If the supported unit needed close support, the GLO would relay the information to the Air Liaison Officer (ALO) who would then contact a waiting flight of aircraft (normally 4 fighters were sent to the unit in contact every 30 minutes), brief them on the mission, and allow them to complete the strike. Target marking procedures



varied, but were generally colored panels, artillery smoke, or by reference to photo or map sections.<sup>17</sup>

Rover Joe was always an experienced fighter pilot, and often a squadron leader. Rover Joe was not a highly desired job in the Air Force at that time—but the Air Force, struggling to separate itself from the ground forces, was reluctant to let anyone other than qualified fighter pilots brief pilots in the air.<sup>18</sup> The duty rotated through the squadron, and pilots would serve approximately 2 weeks at the front. Continuity was achieved by rotating only 1 pilot at a time. Coordination was relatively easy in the more-or-less static Mediterranean Theater. The air-ground lessons learned in Italy were perfected in the fast paced dash across Europe.

In the confusion of the race across France the closest possible coordination was needed. The most difficult Army to support was the swiftest of the ground units, Patton's Third Army. Maj Gen Elwood Quesada, IXth Tactical Air Command Commander, and General Omar Bradley agreed to put Air Support Parties (ASPs) in tanks to cover the armored drive across Europe. This concept was known as Armored Column Cover. Pilots serving as ALOs aboard tanks were usually eager to return to the cockpit of their P-47s and P-51s, which they considered safer.<sup>19</sup>

The natural complement to the high speed armored advance was the Airborne Forward Air Controller (AFAC). Better known by the nickname "Horsefly", the AFACs were controllers who flew along the front lines in L-5 observation aircraft. With their radios, the AFAC could maintain contact with the Ground Forward Air Controller (GFAC), the fighters, and the friendly artillery, making coordination that much easier. The small observation planes were particularly vulnerable to enemy ground fire and fighters, were sometimes hard to find by the friendly fighters, and tended to overload an already strained radio

network. Their advantages, however, outweighed their drawbacks. The Horsefly: gave the FAC the same perspective as the fighters, were stationed well forward and responsive to the needs of the ground commander, could find targets unseen by ground troops, could locate and warn friendly forward units of obstacles, and lastly by his very presence Horsefly had a suppressive effect on the enemy.<sup>20</sup> Horsefly was used successfully in the Mediterranean, European, and CBI Theaters.

When the Korean War erupted in June 1950 the Air Force, a separate service since 1947, found itself unprepared for the close support mission. The money necessary to build and train an effective Tactical Air Force had been scarce in the postwar years, and what money there was went largely to the Strategic Air Command and the atomic capability of the US. Aircrews, generally speaking, had not trained for the close support mission. Very few had training at strafing or air-to-ground "rocketing", the Air Force, instead, had focused on air-to-air combat.<sup>21</sup>

22

The Air Force was better prepared on the ground, with six Tactical Air Control Parties available to the 24th Division when it landed on July 4th. Each party was headed by a GFAC and possessed a WW II vintage VHF (very high frequency) radio installed in a jeep. The parties had some training with the 8th Army through exercises, but generally were not trained and equipped to do the job of giving troop support.<sup>23</sup> The TACPs were organized and equipped under the 1946 Army FM 31-35 because the Air Force had not been able to rewrite all their doctrine since becoming a separate service.

From the beginning, the nature of the Korean War worked against effective close support by the TACPs. The rough nature of the terrain made it difficult for the GFAC to see the enemy, the friendly troops, and the supporting aircraft at the same time. In the fluid situation of the 24th Division's retrograde to the south, it

was difficult for the GFAC to "put the fighter pilots eyes on the target" accurately. The GFAC needed to occupy a vantage point from which he could see the entire battlefield; unfortunately these positions usually exposed the TACP to enemy ground fire. In addition to making line-of-sight visibility difficult, the rough ground over which the GFAC had to drive played havoc with the fragile, old radios and often served to delay his arrival at a crucial point. The results of the close support were varied, but generally not very good. If the GFAC was delayed or unable to control the fighters they often dropped their bombs on targets of lesser importance. Too, incidences of US aircraft dropping ordnance on friendly troops were all too common.<sup>24</sup>

The solution to the mobility and visibility problems of the GFAC was solved with the rebirth of the AFAC. There were no airborne FACS at the outbreak of hostilities in Korea. Since the end of WW II there had been no AFACs trained, despite doctrinal writings supporting their use. The "mosquito" FACS, as they were nicknamed, quickly showed their utility.<sup>25</sup> The T-6 "Texan" trainer aircraft was the aircraft of choice among AFACs because of its ability to absorb small arms damage and evade some of the slower North Korean fighters. To supplement the newly arrived AFACs the 8th Army provided observers to ride in the rear seat of the T-6. These officers not only provided expertise in matters concerning ground maneuver units but also added another pair of eyes to perform reconnaissance and post strike evaluation. The utility of having Army observers was so well demonstrated that at the end of the war each US division had six officers serving with AFACs.<sup>26</sup>

When the AFACs were first introduced into the Korean war the pilots were drawn from the fighter pilot assets already in-country. By 1953, the job had evolved from a temporary duty to a little-sought-after assignment. AFACs came

from all over the Air Force, bombers, fighters, and fresh from pilot training. The full time AFAC flew his first 20 missions, rotated to a ground FAC position for approximately 80 days, then returned to the cockpit to finish his total of 100 missions.<sup>27</sup>

Doctrinally the Army ground commander would keep his ALO nearby to request immediate air support missions and the TACPs near the front line units to direct the arriving fighter aircraft. Unfortunately, the equipment to support this air request net was not yet in country. To make the system work despite the lack of equipment, the commander would keep his TACP (and GFAC) nearby to contact the Mosquito FACs who would, in turn, make contact with the Tactical Air Control Center and relay the request. Since the GFAC could not be on hand to direct the strike himself, he would describe the target to the AFAC and let him direct the strike. AFACs controlled 93% of the close support missions in the first 18 months of the war and by the end of the war the 6147th Tactical Air Control Group had received two Presidential Unit Citations and a Korean Presidential Unit Citation.<sup>28</sup>

The techniques of target marking were similar to those of WW II. Such techniques as, colored panels , artillery smoke , and radio direction (literally talking the pilots eyes on to the target) from the FAC, were used. The best of these, radio directions between the FAC and the fighters, was good--but tended to overburden the UHF radio net, and artillery was often difficult to coordinate. The solution was found by mounting aerial rocket dispensers on the FAC aircraft, loaded with white phosphorus (WP) aerial rockets. This innovative technique of aerial marking was a big help to units conducting close operations. Eventually, however, enemy ground fire directed at the annoying FAC aircraft drove them to higher and higher altitudes, diminishing their capabilities to find the enemy.

Despite their efforts the US Air Force drew criticism from the Army, the press, and the government. It was pointed out that Marine tactical air support was much superior to that of the USAF. According to one Army General:

"During the period 19 September to 20 December 1950 Close Air Support of this division was furnished almost exclusively by the 1st Marine Air Wing. . . in 57 days of combat 1,024 sorties were flown by Marine aircraft (largely in Corsairs) in close support of the division without a single casualty among our own troops due to friendly air action. This record I attribute to the fact that adequate control was available with front line units . . . The Marine system of control, in my estimation, approaches the ideal and I firmly believe that a similar system should be adopted as standard for Army divisions."<sup>29</sup>

Those who criticized the Air Force for its poor showing in the early stages of Korea in comparison to that of the Marines generally acknowledged that the Air Force did an excellent job of improvising, but still held that the Marines were the true professionals in the field. The Marines, it was felt, considered tactical air an integral part of their fire plan while the Air Force and Army saw it as a luxury to be used only on special occasions. It was also noted that Marine TACPs were manned down to Company level while the USAF, at best, usually only manned their TACPs down to the Battalion level, then relied heavily on the Mosquitos to do the actual controlling of air strikes.<sup>30</sup> The Air Force would hear these same complaints, and others, during the war in Vietnam.

Following the Korean War the tactical air control system was once again allowed to fall into a state of doctrinal disrepair. The Mosquito FAC squadrons

were decommissioned and once again the AFAC did not exist except on paper. President Eisenhower's strategy of massive retaliation depended upon powerful, long range nuclear forces. The tactical air forces suffered once again under fiscal restraint as the Strategic Air Command became the cornerstone of the USAF. Even the tactical forces in being, the F-100 Super Saber and the F-105 Thunderchief, were both trained in a nuclear delivery mode.

In 1957, as a result of exercises conducted to study joint air-ground procedures, the Tactical Air Command and the Army's Continental Army Command published their Joint Air Ground Operations. The Joint Air Ground Operations System (JAGOS) that resulted was essentially the close support operating system with which we entered the Vietnam War. This system proved to be too unwieldy to support a limited war such as we found ourselves involved with. In 1965, by which time the USAF had been operating in Vietnam for 4 years, the Chiefs of Staff of the Air Force and the Army agreed to an improved air-ground system that in some ways was similar to that of the US Marine's. The Air Force agreed to provide TACPs from battalion level up to Field Army and immediate requests for CAS were transmitted directly from the TACP to the Direct Air Support Center (today's Air Support Operations Center) in hopes of creating a more responsive system.<sup>31</sup>

Some of the same problems encountered in Korea once again surfaced in Vietnam. The GFAC could not cover the entire battalion area. It was impossible for the GFAC to be everywhere at once and in the guerrilla style, small unit action war, there was no predicting where the enemy would strike next. Under the triple canopy jungle the GFACs visibility was reduced to a few meters and he could not see the supporting fighter aircraft to direct them to the targets. Target marking smoke, by the time it penetrated the thick triple canopy, was so diffused as to be

unusable for a precise reference. The AFAC was clearly needed, and once again the Air Force was unprepared.

In testimony before the US House of Representatives Special Subcommittee on Tactical Air Support (Sept-Oct 1965) the deficiencies of USAF close support and the TACS was brought out.

"...it seems strange to the subcommittee that the Air Force should claim as a new tactic and a new technique developed in Vietnam, a technique which had been used in Korea [AFAC], and it seems even stranger that the Air Force had to go to the Army in order to get the planes required to do the job which the Air Force pilots described as necessary."<sup>32</sup>

The AFAC, once in theater, proved to be invaluable to the USAF air-ground system. So successful, in fact, that there were not enough qualified fighter pilots to man numbers of FAC aircraft demanded by the situation. Regulations called for the AFAC to have at least one year experience in fighters and to attend both the combat operations specialist course and the basic FAC course at the USAF Air-Ground Operations School (AGOS). The requirement for an experienced fighter pilot strained the AF personnel system. One solution was to send young graduates of pilot training to a short course in aerial gunnery flying modified T-33 trainers, making them "fighter qualified FACs". Still, the overwhelming number of AFACs needed could not be provided. To solve the manning problem the Air Force created the B/FAC to supplement the pool of experienced fighter pilots. These FACs were non-fighter pilot qualified and restricted to supporting non-US units and flying Strike Control and Reconnaissance (SCAR) missions where the pilot actually

searched for the enemy by himself. By the end of 1966 there were 250 FACs in South Vietnam alone.<sup>33</sup>

Criticism was once again leveled at the Air Force system of tactical air support. Generally the critics agreed the Air Force was trying to do a good job, but accused the Air Force of placing the direct support of Army units on too low a priority. Critics were quick to point out the success of the Marine system when compared to that of the Air Force. Where the Air Force placed GFACs down to battalion level the Marines placed GFACs down to company, and even patrol level. The Marine close support aircraft, the A-1 Skyraider, was clearly the best CAS aircraft in theater, and the USAF had to get their A-1s from the Navy. The Air Force had never bought an aircraft specifically for the CAS mission, preferring instead multi-role, high-speed fighters. The Navy and Marines, on the other hand, developed the A-7 Corsair and the A-6 Intruder, both with close support in mind.<sup>34</sup>

The latest historical development in the terminal strike control arena was the addition of the enlisted terminal attack control (ETAC) program. Prior to 1986 (except for program verification) the AF had restricted the terminal control of close support missions to ALOs, AFACs and GFACs, who by definition and doctrine were rated (pilot/weapon system officer) officers. As a result of rated manpower shortages and a need for more qualified terminal air strike controllers the AF instituted a training program for selected enlisted members of TACPs. Though problems have surfaced with the program, primarily related to training, initial response from the field have been favorable.<sup>35</sup>



## SUMMARY

The concept of close air support for ground maneuver forces traces its beginnings to the pre-WW II years. Doctrinally, the Air Force gives its first priority to air superiority, and this is understandable since air superiority is necessary for successful prosecution of all other air missions. However, since before WW II the Air Force has been loathe to devote resources to the close support role. Each war has found the AF unprepared to successfully prosecute its close support mission. Funding has been a perennial problem, but faulty doctrine has also played a role in keeping close support from getting the attention it deserved.

The FACs themselves have performed well, despite the lack of training emphasis and oftentimes antiquated equipment. The FACs providing armored column cover allowed Patton to dash across France in WW II. The Mosquito FAC in Korea with its dogged determination and responsiveness virtually stopped daylight movement along enemy lines. In Vietnam the AFAC was the key link to successful CAS by the USAF and two FACs were awarded the Medal of Honor.

The Air Force, in the recent years, has become more aware of its role in close support devoting more resources to CAS and placing increased emphasis on the role of the FAC. Today's Tactical Air Control System evolved from that used in WW II, Korea, and Vietnam, but has undergone significant changes.

## Section 2

### Where We Are Today

The USAF entered the 1980s with a firm commitment to provide the Army with the best possible service from its Tactical Air Control System. TACPs were assigned to Army corps, division, brigade and battalion levels. Their purpose was to advise and assist the ground commander, request and coordinate tactical air support, and meet other related air support requirements of the individual ground force echelon. These TACPs were manned, however, only down to the brigade level with ALOs; FACs were not normally stationed on Army posts. FACs, all qualified pilots, were centralized at Air Force bases under the control of a Tactical Air Support Squadron (TASS).

As an example, in 1982 at Ft. Lewis, Washington, the 1st US Corps (I Corps) was supported by Detachment 6 of the 602nd Tactical Air Control Wing. The senior Air Force Officer on post, an Air Force Colonel from the 602nd Tactical Air Control Wing, was the Senior Air Liaison Officer to the I Corps commander. The Commander of Detachment 6, a Lt. Col., was Senior ALO for the 9th Infantry Division. Each of the three brigades of the 9th ID had one Air Force Major or Captain as the brigade ALO and enough equipment and enlisted "ROMADs" (radio operator, maintainer, and driver) to support two TACPs. These three brigade ALOs were the only habitually associated officers assigned to the brigades--and by regulation the ROMADs in the TACPs were not allowed to control air strikes by themselves.

There were no FACs on hand at Ft. Lewis. Usually the brigade ALO would handle routine CAS terminal strike control during joint training. When

FACs were needed to conduct terminal strike control they were furnished on a temporary basis (TDY) to Ft. Lewis from a TASS as far away as North Carolina. The remainder of the detachment consisted of a Reconnaissance Liaison Officer, an Airlift Liaison Officer, an administrative officer, and several enlisted maintenance personnel.<sup>36</sup>

In 1984 the Chief of Staff of the Army and the Chief of Staff of the Air Force signed a memorandum of agreement to further Air Force-Army cooperation on the battlefield. A portion of this memorandum, Initiative 25, focused directly on the crucial liaison and strike control functions of the TACS, specifically the ALOs and FACs.<sup>37</sup>

Initiative 25 proposed study and action in at least two areas of TACP improvement. First, both services agreed upon the need for improved training in maneuver unit operations for ALOs and FACs. Second, the two services agreed to conduct an in-depth review of FAC operations and TACP structure. This review focused on improving the mobility of the GFAC by augmenting the TACP with an Army helicopter and on supplementing the battalion FACs with non-rated officers. For the first time the two services agreed that other than a rated pilot could act as a FAC.

This review was the catalyst for some much needed change in the FAC/ALO force structure and brought us to where we are today. In the Tactical Air Command, 1986 became "the year of the TACS". A five-year, multi-million dollar enhancement program to modernize the TACS was begun. The aged Mk-107/108 communications jeeps began being replaced by the Army's Highly Mobile Multipurpose Wheeled Vehicle (HMMWV) and 140 new manpower positions appeared "on the books" to meet the Army of Excellence growth.<sup>38</sup>

Training was emphasized during the "year of the TACS": the Joint Firepower Control Course was tailored for ALOs; an ALO Orientation Training Program was created by the host Army unit; Battle Staff Courses were offered to the Division and Brigade ALOs; the Air Force Squadron Commanders Course was offered to selected TACP detachment commanders; and an enhanced TACP ground training regulation and a new TACP Standards/Evaluations (Stan/Eval) Program were both published.

To complete the TACP modernization program:

"a new concept of operations is being developed. The TACAIR [tactical air] advisory function at the battalion level will continue to be accomplished by a tactically qualified rated officer called the Battalion ALO. This Battalion ALO will remain a qualified Ground Forward Air Controller (FAC). The Battalion Close Air Support Control Team will consist of the Battalion ALO, the Certified Terminal Attack Controller (275X0 NCO) [275X0 is the AF occupational specialty identifier], and the Airborne FAC. Any member of the team can provide terminal attack control alone or in concert with other team members."<sup>39</sup>

These Battalion ALOs, normally ranging in rank from 2nd Lt. to Captain, will not be stationed on Army posts. They will, however, be designated "by name" to the Army's 225 active and reserve maneuver battalions. The Battalion ALO will continue to be centrally located at TASSs and will be attached on a TDY basis during major exercises.<sup>40</sup> The Battalion ALO will spend approximately 45 days per year with his designated Army maneuver unit and will perform primarily an advisory role for the Battalion Commander.<sup>41</sup>

The ETAC will remain with the battalion full time. This individual will, for the remainder of the year (when the ALO is not present) be the battalion commander's link to the Air Force. Because of the amount of time spent with the maneuver unit, the ETAC will assume a great deal of the responsibility of the liaison and advisory duties of the ALO as well as their primary terminal air strike control duties. As a result those enlisted members of the TACP chosen to become ETACs will necessarily meet stringent requirements.

Currently ETACs in the Tactical Air Command (TAC) are required, at a minimum, to be an NCO (rank of E-4 or above), have at least one year in the field performing TACP duties, attend the NCO track Joint Firepower Control Course, be certified by the unit commander as Mission Ready in accordance with TAC Regulations, and meet regular recurrency and Stan/Eval requirements.<sup>42</sup> Of the 125 ETACs needed by the Tactical Air Command 78% of the positions are filled with certified Mission Ready personnel as of Oct 88. Worldwide the goal is to produce 225 ETACs, or one per active duty and reserve maneuver battalion<sup>43</sup>

While the Air Force and Army have made substantial doctrinal changes to the way tactical air support is conducted, the USMC, by way of contrast has remained essentially stable doctrinally. Since WW II critics of the USAF/Army system of close support have compared it to the Marine concept. Marine aviation, they say, is dedicated to the close support mission and their tactical air control system is geared with that in mind.

In Korea the Marine system, as noted in the previous section, was said to outperform that of the Air Force by both the press and members of congress. Army spokespeople, while acknowledging the job done by the Air Force, were quick to point out the more responsive nature of the Marine TACS and the higher degree of control exercised by Marine TACPs.

The Marines were also lauded as having a superior close air support system in Vietnam. During testimony before a congressional committee on close air support in 1965, the Marine system of command and control was praised. Unlike the Air Force, their GFACs were assigned down to company level for greater responsiveness and occasionally the GFACs accompanied Marine patrols down to platoon level. Marine AFACs worked in helicopters rather than fixed wing aircraft in order to maintain a closer sense of the current ground situation.<sup>44</sup>

The current Marine field manual on close support, FMFM 5-4, Offensive Air Support, calls for TACPs at two levels--regiment and division TACPs and battalion TACPs. The principal difference between the two:

".....is that the battalion TACP has two forward air control parties, while the regimental and division TACPs have none. ....the battalion TACPs are composed of 3 officers and 12 enlisted communication personnel.....the two FAC parties generally accompany the frontline companies of the battalion during all phases of the amphibious operation."<sup>45</sup>  
[emphasis mine]

By way of comparison, the Air Force Battalion TACP is composed of one AF Officer and one ETAC. An AFAC may be assigned on an "as needed" basis.

Foreign military TACPs are pretty much similar to that of the US. Both the Germans and the Soviets took valuable lessons away from the Spanish Civil War and applied them to WW II. The German success with CAS during their famous *Blitzkrieg* operations was no more successful than that of the Soviets in the latter part of the war. For example during the Petsamo-Kirkenes Operation, 1-3 October, 1944, the Soviets launched a massive close support operation:

"A liaison officer with communications equipment was attached to the command post of each rifle division in the main attack to aid in directing close air support strikes. An additional liaison officer was attached to the tank forces of each corps."<sup>46</sup>

Today the Soviets tactical air control system utilizes a FAC, called a "forward air director" and have organizations similar in most respects to our TACPs called "air task groups". The air task group, like our TACP, advises the ground commander on the use of air resources, transmits air support requests from the commander to supporting air divisions, maintains communication with and control of aircraft in the battle area, and transmits aerial reconnaissance information to the ground commander.<sup>47</sup>

At the division level the air task group is divided into two radio-linked units, one located with the division commander and the other with the chief of staff. While it is rare in the Soviet Army to find an air representative in a ground force battalion, a forward air director, like the US ALO, may be assigned when combat helicopters are providing air support in a particularly important or difficult operation. Normally the battalion commander has no direct communication with the air support resources.<sup>48</sup>

### SUMMARY

The current tactical air control system in use by the Air Force has evolved over the last few years into the most effective close support system in our military history. The emphasis on excellence begins at the Chief of Staff level and has manifested itself in a doctrinally enlarged, better equipped air support system. The

system of by-name assignments of battalion ALOs and the certification of ETACs has put more GFAC qualified personnel than ever before in the main battle area.

Although today our TACPs are more versatile, responsive, and better trained than ever before there are still inherent problems and room for improvement. The next section will examine these shortcomings.



### Section 3

#### Shortfalls In The Current System

The widespread results of recent changes to the TACP structure have contributed only slightly to the overall effectiveness of the Tactical Air Control System. These changes were made as a result of increased emphasis from the highest levels of the Air Force and Army to improve the system. As in any organization, when pressure is applied from the "boss" to get things done, it is possible for quality to be sacrificed for speed. This is especially true in organizations, such as the US military, where key personnel rotate rapidly through jobs every few years or even months.

Coupled with this rapid turnover in personnel is the desire to finish a project as quickly as possible because of perceptions that efficiency ratings are tied to successful project completion. For the military officer it is either "up or out", and no one wants to be left behind. Perhaps as a result of this tendency in human nature to want results now the underlying cause of the problems was missed in favor of immediate, less substantive fixes. For whatever reason, despite changes to the system, the terminal air strike control function of the TACS is not as good as it could be.

According to Air Force Manual 1-1, fundamental to understanding warfighting principles is the recognition of three essential factors--man, machine, and environment.<sup>49</sup> To properly examine the shortfalls in today's terminal strike control capability we will expand upon these and focus upon the three "domains" of battle, physical, cybernetic, and moral.

## THE PHYSICAL DOMAIN

The physical domain is made up of the effects of technology, logistics and terrain. Technologically the USAF Tactical Air Control Party is second to none. The radio suite mounted on the TACP's vehicle consists of HF, VHF, UHF, and FM radios--all capable of simultaneous use. Coupled to this impressive array of radios is secure transmission capability and the latest anti-jam technology. These radios can be mounted on a jeep, a HMMWV, or an armored personnel carrier. Additionally the TACP has access to a wide variety of back-portable radios with similar capabilities. The TACP can theoretically communicate around the world, but in reality the capability is much more restricted.

Both the enemy and the effects of terrain will conspire to decrease the TACP's radio range. A fact of life about radios is that most are line-of-sight transmitters and receivers. An intervening hill mass or dense foliage will degrade most radios. The HF radio, with world wide capability, is the most susceptible to the effects of weather and atmospheric interference. Too, on today's battlefield the enemy will not willingly concede unimpeded radio communications. The electronic signature of the TACP is large and easily targeted, and despite the high-tech anti-jam radios, the TACP is very susceptible to jamming from the enemy. But these are problems faced by every radio user, friend and foe alike--more important for us is the impact of terrain, in the form of time and distance, on the limited TACP resources.

Today we suffer from the same problem as during the Korean War--the numbers of terminal air strike controllers (TASCs) available are insufficient to cover the entire front. With the increase of lethality and range of nearly all weapons

systems the typical depth and frontage of a modern mechanized battalion has increased proportionately. The threat of nuclear weapons effects also demands a more widely dispersed battlefield.<sup>50</sup>

In a typical battalion there are two individuals doctrinally capable of controlling air strikes, the ALO and the ETAC. Because of the nature of the system, the ALO will probably be co-located with the Battalion Commander, behind the line of contact, performing his liaison and advisory function. This leaves the one permanently assigned ETAC to control air strikes over the entire battalion frontage. CAS is highly flexible, and can hit where needed--will the GFAC be there to control the CAS? The nature of terrain in most areas of the world will not allow only one controller to cover an entire battalion frontage. Even if both TASCs were present on the line to control the air strike, it would require a great deal of movement to be in the right place at the correct time. By the time he gets in position, it could well be too late. This problem was noted in a Commanders Memorandum from the National Training Center:

"There is a dilemma inherent in having only one ground FAC with a battalion task force. He frequently needs to be in two places at one time--with the commander and FSO [fire support officer] coordinating fire support and maneuver and at a vantage point directing aircraft to their target. Sometimes these two functions can be performed at the same location but often they cannot. ....FSOs, company officers, and scouts must know how to give final approach instructions to A-10 pilots."<sup>51</sup>

Perhaps the most significant factor is the lack of redundancy in the terminal strike control system. Without a doubt the TACP has a distinctive electronic "signature". When located alongside command and control elements or target

marking agencies such as artillery and mortar forward observers, the TACP becomes a veritable antenna farm and a highly lucrative target for the opposing forces. With only two controllers per battalion the loss of only one system could be catastrophic. Even if the TACP personnel survive, the radios are irreplaceable. The only USAF CAS aircraft capable of talking on FM radio, the Army's system, at this time is the A-10. If other aircraft arrive such as the F-16 or F-4, the Army Battalion would be unable to communicate with the fighters.

Other factors begin to mount against successful CAS when the TACP is out of action. If Army personnel did manage to make contact with the supporting aircraft, most have never controlled an air strike before. Time is critical on today's mid- and high-intensity battlefields. Because of the lethality of modern anti-aircraft systems, supporting fighters will not be able to loiter over the battlefield to communicate with a novice air strike controller.

One answer to the communications problem is the AFAC. The AFAC is capable of communicating with ground controllers, Army command and control, and the CAS aircraft. However, the same problems that prevent the CAS aircraft from remaining overhead prevent the AFAC from flying over the front to control the strike. In situations where the enemy anti-air threat is high, the AFAC will be reduced to flying well back of the frontlines and performing the role of an airborne coordinator--unable to see the targets, and generally out of touch with the ground situation.

The solutions to these physical problems are not easy, but the problems can be ameliorated to some extent. Helicopter assets, dedicated to the TACP would help solve the problems of mobility, flexibility, and radio communications. The helicopter could deliver the TASC to the correct location, furnish him an elevated platform from which to assess the situation, and allow him much improved line-of-

sight communications. Too, the survivability of a helicopter flying nap of the earth is much greater than that of a fixed wing AFAC aircraft. Another plus for the use of helicopters would be the coordination of mixed helicopter and fixed wing aircraft missions (JAAT). JAAT missions synergistically increase the effectiveness of both the rotary wing and fixed wing assets.

The lack of redundancy caused by such small numbers of TASCs could be solved by training more terminal air strike controllers. The Air Force could increase the emphasis on the ETAC training program to increase the numbers, but an even larger pool of qualified controllers exists in the Army's artillery forward observers (FO), fire support teams (FIST), and scout helicopters. Air Force Regulation 2-1 states:

"In an emergency situation even though a qualified FAC is not available, the ground commander may elect to request an air strike. If he makes this determination the ground commander concerned must assume the responsibility for troop safety. In this situation, an artillery or mortar Forward Observer (FO) is the preferred substitute for the FAC for identifying/ marking the target."<sup>52</sup>

The terminal control of CAS is, in reality, not particularly difficult once you have had the opportunity to observe the procedures at close range and ask a few questions. It would seem logical that any procedure capable of being learned by an Air Force ETAC could be learned by an Army FO. There is a two-part stumbling block to this solution, however.

During the initial training the TASC, and to remain truly proficient at controlling CAS, he must get a chance to practice with actual aircraft on a regular

basis. With today's constraints on flying hours and flying dollars it does not seem likely that more sorties will be generated for the express purpose of training Army personnel to control CAS. Not all the training must occur using live aircraft however, and even today some informal joint training takes place.

"Our ALOs spend a lot of time training Rangers [this article was written about the Ranger Battalion TACP] to control air strikes.....The fire support teams direct Army artillery, but they must know how to direct aircraft in case the tac air team is knocked out on the battlefield.""<sup>53</sup>

A more efficient training program coupled with creative sortie planning from the Air Force would go a long way to giving the Army more qualified air strike controllers.

The second stumbling block for having Army controllers lies in the area of certification. The Air Force is particularly sensitive to this issue. The ETAC must be "certified" by the Air Force Detachment Commander. This certification can be revoked for several reasons, among them: failure of periodic Stan/Eval tests, both written and oral; demonstrated inability to perform the necessary tasks to necessary standards; and failure to control the requisite number of air strikes during a specified period, generally quarterly or semi-annually.<sup>54</sup> To meet peacetime safety restrictions and lend overall credibility to an Army TASC program, the Army would have to accept a similar, if not identical, accreditation program for its terminal strike controllers.

## THE CYBERNETIC DOMAIN

The TACP is not only responsible for controlling CAS but is also responsible for operating and maintaining the Immediate Air Request Net. The air request net is based on HF radio communications from the TACP direct to the Air Support Operations Center (ASOC). The request is made on behalf of the ground commander and is monitored by the TACP at each echelon above the requestor. At any level the request can be denied if there are other, organic, assets available to do the job.

Is the Air Force really needed in the request system? The Air Force runs the immediate request net, but all requests originate with the Army unit commander. The TACP above the requestor may deny the request, but only after coordination with such Army organizations as artillery and attack helicopters to see if they can accomplish the mission. In Korea, the Army ran the immediate air request net and critics said the operation was ponderous and tended to bog down under the increased levels of coordination needed to forward a request. Perhaps the answer lies with a compromise in the two systems, using the fire support net to request CAS up to a certain level, then entering an Air Force net. The system, as it is now, works well enough in peacetime, but during combat the HF radio net will be next to useless, and the process of having to coordinate between the Air Force and Army at every level too time consuming.

Another cybernetic concern is that of current doctrine. TAC Manual 2-1, the Tactical Air Command's capstone tactical doctrine is dated 15 April 1978--more than ten years old. In that same amount of time AFM 1-1, Basic Aerospace Doctrine, and Army FM 100-5, Operations, have each been updated twice. The Air

Force needs to update its Tactical Doctrine to reflect a greater emphasis on its part in AirLand Battle Doctrine.

### THE MORAL DOMAIN

Everyone is familiar with the saying "The moral is to the physical as three is to one." This is especially true in the close air support and terminal strike control arena. Effective terminal strike control will have an effect on not only the physical battlefield but the morale of the supported ground units. Having responsive CAS to supplement both direct and indirect fire weapons systems is an effective morale booster. Conversely, having 500 pound bombs that were expected to be dropped on the enemy, dropped instead on friendly troop positions has a devastating effect on morale. The moral aspects of the terminal strike control we will examine here are the effects of leadership, experience, and commitment.

The leader of the TACP is the Air Liaison Officer. Who are these men chosen to represent the Air Force in Army Headquarters and on the frontline of battle? What motivates these men to work in so alien and hostile an environment so far from the familiar cockpit? What are the requirements to become an ALO or FAC?

The Tactical Air Command, in its assignment policy as stated in TAC Regulation 36-3, fills Air Support Liaison and Forward Air Controller positions with "highly qualified officers", and "whenever possible these officers will be volunteers"<sup>55</sup> [emphasis mine].

To become an ALO the requirements are simple. According to AFR 36-1, Officer Personnel/Officer Classification, if you are a qualified weapons system officer (WSO) you must meet a great many qualifications, none of which are



extraordinary, and none of which particularly qualify an officer to lead a TACP into combat. While other requirements that do not relate to the ALO job are mentioned, knowledge of Army tactics, AirLand Battle Doctrine, or the TACS is not mentioned at all.<sup>56</sup> To become a FAC the requirements are similar with the added exceptions of a knowledge of Army tactics and a familiarity with the TACS, also "a minimum of 1 year's experience is desirable as a pilot of tactical fighter aircraft".<sup>57</sup>

Who actually goes to the FAC/ALO assignment? The personnel filling the jobs fall generally into five categories:

1. first assignment FACs who leave pilot training, attend a fighter lead-in course, and go directly to TASSs as "qualified fighter pilots".
2. second assignment fighter pilots (with enough years active duty commitment remaining to be unable to refuse) filling undesirable ALFA (Air Liaison, Fac, Air Training Command) assignments.
3. officers deferred for promotion who can either accept the assignment or separate from the service.
4. pilots who are dissatisfied with their current aircraft and see an ALO/FAC tour as a way to move into a new fighter, and WSOs who, because of the drawdown in F-4s, have no cockpits to go to.
5. genuine volunteers who are interested in seeing the close support system work to its limits.

Approximately 65% of the FAC/ALOs today fall into the first category, the first assignment FAC. These are the "by name ALOs" that support the battalion 45 days per year. They meet the "fighter pilot" requirement only by attending an orientation course flown in AT-38s (a modified trainer) to familiarize them with the fighter pilot's world.<sup>58</sup>

Approximately 30% of the FAC/ALOs fall into the categories 2 through 5. Category 2, the second assignment fighter pilot is a sore subject to the Air Force at this time. Retention is at an all time low for the Air Force and a great number of pilots leave the service for the airlines. FAC/ALO duty is seen as undesirable and if the pilot has the option he may opt to separate from the service rather than spend two non-flying years on an Army post. Category 3 ALOs are those who have been passed over for promotion, for whatever reason, and are no longer competitive in the up or out Air Force system. It is perceived that the ALO field has a disproportionate number of deferred officers compared to other jobs in the Air Force. Being passed over doesn't mean the officer will be a poor ALO, but his contributions are more likely to be immediate, rather than long-term. Numbers of category 4 ALOs are growing rapidly with the drawdown in F-4 cockpits. WSOs, the rear-seat crewmember in F-4s, are using the ALO field as a holding pattern, waiting for the follow-on two seat fighter to become operational. Pilots in category 4 can leave an undesirable fighter such as the A-10, F-4G, or F-111 and after two years as an ALO, stand an excellent chance of transitioning into a newer, more desirable, high performance fighter such as the F-16 or F-15. There are few, if any, category 5 FAC/ALOs and practically no second tour FAC/ALOs.<sup>59</sup>

How does the Air Force solve the problem of finding willing volunteers for FAC/ALO duties who are genuinely interested in working to improve the system? The solution lies in a twofold program of education for tactical crewmembers and genuine interest from senior Air Force leaders.

From the beginning young Air Force officers are indoctrinated overtly and covertly against seeking jobs associated with the Army. After all, they joined the Air Force, not the Army. Healthy interservice rivalry is a good thing, but due to a lack of understanding of the Army and the Army's mission, Air Force pilots usually

look upon the Army with disdain. For most young Air Force aviators their knowledge of the Army is gleaned from television and movies. Is it any wonder the young pilot would prefer to remain in a fighter cockpit after watching such movies as "Full Metal Jacket" or "Platoon" that vilify the war on the ground and the movie "TOP GUN" which glorifies the life of tactical aircrewmembers? An active program of instruction on the real Army would go a long way towards attracting volunteers.

Coupled with this program of officer education must be a real and visible concern from the senior Air Force leaders on close support and the TACS. Now the job is seen as merely "two years out of the cockpit, on an Army post, away from the mainstream of the Air Force". This image must end. Promotions for aircrewmembers serving as FAC/ALOs must equal or exceed the that of the rest of the Air Force. When officers perceive their careers to be enhanced by the FAC/ALO tour and the job is perceived as vital to the interests of the tactical air force, then more volunteers will appear and a new era of interservice cooperation will begin.

The ETAC, while not an officer, suffers from similar problems. Retention is a key problem to the "275X0" career field. For the ETAC serving on Army posts is a career, not just a two year assignment like the ALO. When the ETAC joined the Air Force he probably had no idea his career would be spent not on an Air Force base, but in the field with the Army.

Currently the figures show a retention rate (a measure of those remaining in the service past their initial separation date) for 275X0s as about average for the Air Force. What the figures do not show is the "keep rate", or the numbers of 275X0s that leave the career field, but remain in the service. Currently a 275X0 can reenlist with cross training to another career field guaranteed. After all, it takes no "mental

giant" to see that an airman working in a nice, clean, Air Force office who never goes to the field with camouflage on his face, earns the same pay as a 275X0 who practically lives in the field.<sup>60</sup>

The real retention figures, the career "keep rate", are not good for 275X0s. The Air Force considers the 275X0 specialty to be a Chronic Critical Career Field for the grades of Sergeant through Master Sergeant. The figures speak for themselves:

|                       | <u>Retention Rate</u> | <u>Career Keep Rate</u> |    |
|-----------------------|-----------------------|-------------------------|----|
| 1st term reenlistment | 65%                   | 51%                     |    |
| 2nd " "               | 83%                   | 73%                     |    |
| 3rd " "               | 100%                  | 74%                     | 61 |

The solution to the 275X0 career retention problem is a bit more straight forward. First a recruiting program needs to be aimed at finding motivated, aggressive, responsible enlisted men (the same qualities desired by all other career fields). With proper emphasis from senior Air Force leaders this recruiting program could be successful. Next, the 275X0 needs to be given more responsibility--the ETAC program is a terrific step in the right direction. Lastly there is the issue of bonus or specialty pay. It is perceived by the 275X0 community that Combat Control Teams (a Military Airlift Command asset that routinely works with Army units) do similar or less demanding tasks, yet receive more pay in the form of bonuses. A similar bonus rewarding a demanding Air Force career should be considered for 275X0s.

A last option that must not be overlooked is that of giving the 275X0 career field to the Army. This would do away with the need for specialty pay, the

problem of keep rates, and the need for selective recruiting. By creating a separate military occupational specialty (MOS) that is identical to that of the existing Air Force 275X0, the Army would guarantee itself on the spot, dedicated close air support specialists. This would serve also to free up enlisted manpower assets for the Air Force and reduce the need for rated GFACs.

### SUMMARY

Today our TACPs are more versatile, responsive, and better trained than ever before. Emphasis placed on the TACP from the highest Air Force and Army levels has sparked the much needed changes to upgrade the system to support the AirLand Battle Doctrine agreed upon by both services. However these changes do not solve the underlying problems of the TACP. Problems still exist in the physical, cybernetic, and moral domains of battle.

The problems that exist, however, can all be solved, over time, by a genuinely concerned and dedicated senior level leadership. Creative solutions to problems should not be discarded because of interservice rivalry or perceived "turf problems". By dedicating resources and starting now on a long-term program of cross service education, the Tactical Air Control System, and its terminal air strike control, can be much improved.

## CONCLUSION

This paper has examined the Tactical Air Control Party and its personnel: the ALO, GFAC, AFAC, ETAC, and 275X0. The system as it exists today is as responsive and flexible as at any time in our military history. This is not to say there is not room for improvement, however.

In WW II each major theater of war and each major participant created its own system of close air support and terminal strike control. The Germans fought the war with a system begun in the Spanish Civil War and refined through the *Blitzkrieg*. The Soviets used a similar system during WW II. The Allies finally settled on a system of terminal strike control copied from the British and Australian Army. The ultimate terminal strike control came in the form of Rover Joe, Armored Column Cover, and Horsefly. During the allied pursuit across Europe these forward controllers revolutionized close air support.

The US, after WW II, forgot some of the major lessons learned and was caught unprepared at the outbreak of the Korean War. Horsefly FACs were reinvented and nicknamed the Mosquito FAC; these AFACs were a major contributor to the USAF CAS effort in Korea. The GFACs in Korea did not receive such praise, through no fault of their own. Before the outbreak of hostilities the TACS and TACPs were underfunded and ill equipped. The GFACs were stretched too thin across the frontage of the Army and were hampered by old, fragile equipment. When compared to the Marine system of CAS the USAF system took only second place.

Following the Korean War the US retreated under the umbrella of Massive Retaliation and once again the tactical forces suffered severe budget constraints. The Mosquito FAC was, like the Horsefly FAC before him, disbanded at the end of

hostilities and doctrinally forgotten. The TACS was not forgotten, however, and steps were made to improve the command and control system that had been so cumbersome in Korea. Despite the changes made to the TACP, the USAF was ill-prepared to support the Army in Vietnam.

In Vietnam the Air Force once again had to reinvent the AFAC, this time borrowing observation aircraft from the Army. Under the dense triple canopy the GFAC was useful only for coordinating with the AFAC who then directed the supporting fighters where to drop their ordnance. It was determined that the A-1E Skyraider, an aircraft borrowed from the Navy, was the best for close close support. The Air Force was criticized by the congress for being unprepared to support the Army in this type of war.

As a result of increased interest from the Chiefs of Staff of the Army and Air Force, changes were made to the system of terminal strike control that so far had been found wanting at the outbreak of every major hostility. These changes were needed, but were only superficial. The underlying problems with terminal strike control were not solved.

Today Air Force pilots and WSOs still do not want to become FACs or ALOs. The majority of those who go have no choice in the matter, being new to the service and therefor taking whatever assignments are given them. Those who do voluntarily go to the ALO/FAC world generally go because there is no other place to go, in the case of the F-4 WSO, or because they see the two year ALO/FAC tour as a way out of a disagreeable assignment or aircraft. Among those who do serve a tour as a FAC/ALO there is seldom a second tour in the TACS during their careers.

Enlisted terminal strike controllers are a major improvement to the system. These individuals stay with their battalion full time, unlike the "by name ALO" who

spends approximately 45 days per year with his unit. Too, the ETAC and the uncertified "ROMADs" who make up the TACP are in the field for a career, not just one two-year tour out of a pilot's career. Unfortunately the 275X0 career field is only just now receiving the attention it deserves in the form of ETAC responsibility.

The solutions to these recurring problems is rooted in genuine senior level commitment to change the system. An educational process must be instituted to help break down the parochial interservice barriers. The educational process must start early for Air Force officers and remain as part of an ongoing program throughout their careers. The FAC/ALO tour needs to become a career enhancing step for a career, not merely a two year layoff out of the mainstream of the Air Force. The true professionals in the field, the ROMADs, need to be rewarded for the work they do. Bonuses, increased responsibility, and enhanced promotion potential are all needed in the 275X0 career field.

Another, less popular, option is open. Surrender those jobs that do not absolutely need to be filled by a rated Air Force officer to the Army. Creating a TASC career field in the Army and dedicating assets for training the Army controllers should be looked at as alternatives for optimizing the terminal strike control process.



## ENDNOTES

<sup>1</sup>Air Force Manual 1-1, p 2-4

<sup>2</sup>Sherrod, Robert., History Of Marine Corps Aviation In World War II  
p.25

<sup>3</sup>Proctor, Raymond L., Hitler's Luftwaffe In The Spanish Civil War p.  
256

<sup>4</sup>Ibid p. 84

<sup>5</sup>Elstrob, Peter, Condor Legion. p. 153

<sup>6</sup>Hightower p. 31

<sup>7</sup>Institute of Special Studies, A Short History p. 5

<sup>8</sup>Army Ground Forces and The Air-Ground Battle Team p. 13

<sup>9</sup> US Army Combat Developments Command, A Short History p. 16

<sup>10</sup>Basic Field Manual, Aviation In Support of Ground Forces. April 1942.  
p. 2,4

<sup>11</sup>Hightower p. 41

<sup>12</sup>Ibid p. 44

<sup>13</sup>HQ Army Ground Forces Reports, Special Report, 31 March 1945 p. 12

<sup>14</sup>Ibid P. 43

<sup>15</sup>US Army Combat Developments Command A Short History p. 21

<sup>16</sup>As noted in Hightower, P. 45.

<sup>17</sup>HQ Army Ground Forces Reports, Special Report (Close Air Support) 31  
March 1945 p.5

<sup>18</sup>Ibid p.3

<sup>19</sup>Bailey, Ronald H., The Air War In Europe , p 176.

<sup>20</sup>Hightower p. 51

<sup>21</sup>US News and World Report, 3 November 1950. p. 17

<sup>22</sup>For example in Army, Navy, Air Force Journal, 9 Feb 1957, Gen. Twining, Chief of Staff of the Air Force said in an interview that "the Army has different types of missiles that can use atomic weapons if required and they can take care of a great part of this close support." When asked by a congressman if in his judgment the Army could produce more close support for its ground troops with its missile capability than it will lose because of the cutback in fighter support he answered, "Yes, I feel that way".

<sup>23</sup>Hightower p. 60 also Brotherton p. 56 and US News and World Report, 3 November 50 p. 17.

<sup>24</sup>Brotherton, Robert G., "Close Air Support In The Nuclear Age." Military Review, p. 56 also Hightower p. 61

<sup>25</sup>Boggs, John A., Initiative-25 And The Need For Terminal Airstrike Control At The Company Level. p. 5

<sup>26</sup>Hightower p. 62

<sup>27</sup>Ibid p. 64

<sup>28</sup>Ibid p. 66

<sup>29</sup>Sherrod p. 290 Letter from B.G. Homer W. Kiefer, 7th ID Artillery Commander, to the Commandant of the Marine Corps.

<sup>30</sup>US News and World Report, 3 November 1950 p. 17-19.

<sup>31</sup>Hightower p. 80-81

<sup>32</sup>House Committee on Armed Services, Report Of Special Subcommittee On Tactical Air Support February 1966. p. 4864.

<sup>33</sup>Hightower p. 84

<sup>34</sup>Report Of Special Subcommittee p. 4864

<sup>35</sup>Interview with SMSGT Tom DeFrangé, 28 Oct. 88

<sup>36</sup>Personal experience of the Author, assigned to Det. 6 as an ALO from July 1980 to July 1982.

<sup>37</sup>Davis, Richard G., The 31 Initiatives. p. 35, 60.

<sup>38</sup>Tactical Air Control System Quarterly, Report No. 1, April 1986. p. M-6

<sup>39</sup>Ibid p. M-13

<sup>40</sup>Ibid p. M-15

<sup>41</sup>Interview with MSGT DeFrangé, NCOIC, HQ TAC/DOYF. 28 Oct 88.

<sup>42</sup>Tactical Air Command Regulation 50-12, Tactical Air Control Party, Ground Training and unit local supplement, DOI.

<sup>43</sup> DeFrangé, Interview 28 Oct 88.

<sup>44</sup>Hearing Before The Special Subcommittee On Tactical Air Support. p.4744-4749

<sup>45</sup>Fleet Marine Field Manual 5-4, Offensive Air Support. p.26-27

<sup>46</sup>Gebhardt, James F., "The Petsamo-Kirkenes Operation, 1-3 October 1944, A Soviet Joint and Combined Arms Operation On Arctic Terrain." p.89

<sup>47</sup>Bowman, Steven R., Soviet Tactical Air Support Of Ground Forces. p. 6

<sup>48</sup>Ibid p. 6

<sup>49</sup>Air Force Manual 1-1. p. 2-4

<sup>50</sup>Schneider, James J., "The Theory Of The Empty Battlefield". RUSI, September, 1987. p. 37-44

<sup>51</sup>National Training Center Lessons Learned, Commanders Memorandum. 20 November, 1985. p. 7

<sup>52</sup>Tactical Air Command Manual 2-1, Tactical Air Operations. p. 3-18

<sup>53</sup>Roberts, Bill, "Bridging The Gap". The Airman, March 1987. p.31.

<sup>54</sup>Tactical Air Command Regulation 50-12, Tactical Air Control Party, Ground Training.

<sup>55</sup>Tactical Air Command Regulation 36-3 (Draft), Air Liaison Officer (ALO)/Forward Air Controller (FAC) p. 1

<sup>56</sup> The following are examples of the qualifications as stated in AFR 36-1:

Mandatory knowledge of preparation of operational plans and training requirements, electronic theory, radar and navigation equipment, air navigation, meteorology, electronic warfare principles, bomb ballistics, and operation of bomb-nav systems, aircraft performance capabilities, characteristics, and limitations. A Master's degree in management or business administration is desirable. Experience is mandatory in air navigation techniques, cruise control planning, use of protective equipment and oxygen, and the operation of training standards, policies, and operational plans and orders. Completion of a nuclear weapons delivery instructor course is desirable.

<sup>57</sup>Air Force Regulation 36-1, Officer Personnel/Officer Classification. p A8-92, 93

<sup>58</sup>Gorman, Thomas, Major, USAF. Chief of Command, Control, Communications and Intelligence, USAF Air Ground Operations School, Hurlburt Air Force Base, Fl. Interview, 26 October 1988.

<sup>59</sup>Ibid

<sup>60</sup>Defrange, Thomas, SMSGT, USAF. NCOIC, HQ TAC/DOYF, Langley AFB, Va. Interview, 28 October 1988.

<sup>61</sup>Ibid

## BIBLIOGRAPHY

### BOOKS

Air Force Historical Foundation, Tactical Air Power: Cutting The Enemy's Arms And Legs. New York, NY: James Parton And Company, 1980.

Bailey, Ronald H., The Air War In Europe. Alexandria, Va: Time-Life Books Inc., 1979.

Baynes, John, Morale--A Study Of Men And Courage. Garden City Park, NY: Avery Publishing Group Inc., 1988.

Davis, Richard G., The 31 Initiatives. Washington DC: Office of Air Force History, 1987.

Elstrob, Peter, Condor Legion. New York, NY: Ballantine Books Inc., 1973.

Flughum, David, and Terrence Maitland, South Vietnam On Trial: Mid 1970 to 1972. Boston, MA: Boston Publishing Company, 1986.

Kellett, Anthony, Combat Motivation--The Behavior Of Soldiers In Battle. Boston, MA: Kluwer•Nijhoff Publishing, 1982.

Momyer, William W., Air Power In Three Wars. Washington DC: Office of Air Force History, 1979.

Mortensen, Daniel R., A Pattern For Joint Operations: World War II Close Air Support North Africa. Washington DC: Office of Air Force History and U.S. Army Center of Military History, 1987.

Proctor, Raymond L., Hitler's Luftwaffe In The Spanish Civil War. Westport, Cn: Greenwood Press, 1985.

Rudel, Hans Ulrich, Stuka Pilot. New York, NY: Ballantine Books, 1958.

Sherrod, Robert, History Of Marine Corps Aviation In World War II. San Rafael, Ca: Presidio Press, 1980 (original copywrite 1952).

Smith, Peter C., The History Of Dive Bombing. Annapolis, Md: The Nautical & Aviation Publishing Company, 1981.

### Magazines

"House Group Alks Army Close Air Support Study; AF Says Marine System Too Costly". Army, Navy, Air Force Journal, 9 Feb 1957, pp 1,9.

Brotherton, Robert G., "Close Air Support In The Nuclear Age." Military Review, April 1959.

Futrell, Robert F. and Albert F. Simpson, "Air War In Korea: II." Air University Quarterly Review, Fall, 1951.

Gibbs, George, "The Control of Close Air Support For The Ground Forces". Asian Defence Journal, May 1987.

Meyer, Ross L., "Of ALOS, FACS, And TACS". Military Review, October 1986.

Miller, Keith, "Making the FAC Formula Work". Marine Corps Gazette, May 1987.

Pavsner, Alan R., "Control of Close Air Support". Marine Corps Gazette, October 1987.

Roberts, Bill, "Bridging The Gap". The Airman, March 1987.

Schneider, James J., "The Theory Of The Empty Battlefield". RUSI, September, 1987.

Standish, Anthony, "Infantry-Air-Support Single Command". Combat Forces Journal, July 1952.

"Weakness In Air Force." US News and World Report, 3 November 1950.

"How Air-Ground Co-Operation Pays Off". US News and World Report, 8 September 1950.

### MANUALS

Air Force Manual 1-1, Basic Aerospace Doctrine Of The United States Air Force. Washington DC: HQ United States Air Force, 16 March 1984.

Air Force Regulation 36-1, Officer Personnel/Officer Classification. Washington DC: HQ United States Air Force, 1 January 1988.

Basic Field Manual FM 31-35, Aviation In Support of Ground Forces. Washington DC: HQ United States Army, 9 April 1942.

Fleet Marine Field Manual 5-4, Offensive Air Support. Washington, DC: HQ United States Marine Corps, 1979

Standard Operating Procedures, Detailed Standard Operating Procedure, Fire Support Coordination Center, X US Corps. APO 909, 22 November 1951.

Tactical Air Command Manual 2-1, Tactical Air Operations. Langley Air Force Base, Va: HQ Tactical Air Command, 1978.



Tactical Air Command Regulation 36-3 (Draft), Air Liaison Officer (ALO)/Forward Air Controller (FAC). Langley Air Force Base, Va: HQ Tactical Air Command, 1988 (current Reg. dated 29 Feb 80).

Tactical Air Command Regulation 50-12, Tactical Air Control Party, Ground Training. Langley Air Force Base, Va: HQ Tactical Air Command, 1987. And DOI 50-12, unit supplement to the TAC Reg. furnished by Det. 6, 602nd TAIRCW, Ft. Lewis, WA.

### OTHER SOURCES

Air Force Military Personnel Center, Rated Officer Assignments Guide. General Distribution, USAF, Randolph AFB, Texas, 1988.

Air Force Military Personnel Center, Commander Assignment Guide. General Distribution, USAF, Randolph AFB, Texas, 1986.

Boggs, John A., Initiative-25 And The Need For Terminal Airstrike Control At The Company Level. Unpublished student report, Air Command and Staff College, Maxwell Air Force Base, Alabama, 1988.

Bowman, Steven R., Soviet Tactical Air Support Of Ground Forces. Washington, DC: Department of Defense Intelligence Document prepared under an interagency agreement for the Soviet/Warsaw Pact Division, Directorate for Research, Defense Intelligence Agency, 1985.

Defrange, Thomas, SMSGT, USAF. NCOIC, HQ TAC/DOYF, Langley AFB, Va. Interview, 28 October 1988.

Gebhardt, James F., Major, US Army, Soviet Army Studies Office. "The Petsamo-Kirkenes Operation, 1-3 October 1944, A Soviet Joint and Combined Arms Operation On Arctic Terrain". Unpublished Manuscript

Gorman, Thomas, Major, USAF. Chief of Command, Control, Communications and Intelligence, USAF Air Ground Operations School, Hurlburt Air Force Base, Fl. Interview, 26 October 1988.

Hightower, Charles D., The History Of The United States Air Force Airborne Forward Air Controller In World War II, The Korean War, And The Vietnam Conflict. Unpublished thesis, Command and General Staff College, Ft. Leavenworth, Kansas, 1984.

Historical Section, Army Ground Forces, Army Ground Forces and The Air-Ground Battle Team (Including Organic Light Aviation) Study No. 35. Historical Study, Department Of The Army, Fort Monroe, Va., 17 May 1948.

Holcomb, James F., Recent Developments in Soviet Helicopter Tactics. RMA Sandhurst, GB: Soviet Studies Research Centre, 1986.

House Committee on Armed Services, Hearing Before The Special Subcommittee On Tactical Air Support—22, 23, 28, 29, 30 September and 6 and 14 October, 1965. Washington, DC: US Government Printing Office, 1966.

House Committee on Armed Services, Report Of Special Subcommittee On Tactical Air Support February 1966. Washington, DC: US Government Printing Office, 1966.

Hozzel, Paul-Werner, Brig. Gen. (Ret) German Air Force, Conversations With A Stuka Pilot. Carlisle Barracks, PA: Transcript of National War College Conference, 1 November 1983.

HQ Army Ground Forces Reports;

Immediate Report 28, 15 January 1945

Immediate Report 38, Undated (distributed 14 Oct 44)

Special Report (Close Air Support) 5 September 1944

Special Report (Close Air Support) 31 March 1945

AGF Report A-172, 17 July 1944

AGF Report c-476, 28 December 1944

Combat Observations, 23 December 1944

Headquarters, European Theater Of Operations, United States Army, War Department Observers Board.

National Training Center Lessons Learned, Commanders Memorandum. Headquarters, National Training Center and Ft. Irwin, Ft. Irwin California, 20 November, 1985.

Opp, Gill, Major USAF. Assignment Officer, Tactical Fighter Branch (DPMROF), AFMPC, Randolph AFB, TX: Interview 3 November 1988.

Tactical Air Control System Quarterly, Report No. 1, April 1986. Headquarters TAC/DOYS, Langley AFB, VA.

US Army Combat Developments Command, Institute of Special Studies, A Short History Of Close Air Support Issues. H.Q. US Army Combat Developments Command, Fort Belvoir, Va., July 1968.